# Accelerated Algebra 2 January Exam Review Answer Key

## Part I: Algebra Review

1. a) $25 = \frac{2x}{3} - 10$

$+10 \quad +10$

$\frac{3}{2}(35) = \left(\frac{2x}{3}\right)\frac{3}{2}$

$x = 105/2$

b) $12 - 3(2w+1) = 7w - 3(7+w)$

$12 - 6w - 3 = 7w - 21 - 3w$

$9 - 6w = 4w - 21$

$30 = 10w$

$w = 3$

c) $t - 3(t + \frac{4}{3}) = 2t + 3$

$t - 3t - 4 = 2t + 3$

$-2t - 4 = 2t + 3$

$-7 = 4t$

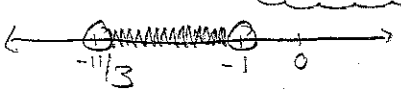
$t = -7/4$

d) $4 < y = 3x < 12$

$-1 \quad -1$

$3 < -3x < 11$

$-1 > x > -11/3$ OR $-11/3 < x < -1$




e) $6(x+2) \geq 24$ OR $5x + 10 \leq 15$

$6x + 12 \geq 24$ $\quad -10 \quad -10$

$6x \geq 12$ $\quad 5x \leq 5$

$x \geq 2$ OR $x \leq 1$


f) $3|3x+4| - 2 = 10$

$3|3x+4| = 12$

$|3x+4| = 4$

$3x+4 = 4$ $\quad 3x+4 = -4$

$3x = 0$ $\quad 3x = -8$

$x = 0$ OR $x = -8/3$

*check for extraneous

g) $4|4-3x| = 4x + 6$

$|4-3x| = x + 3/2$

$4 - 3x = x + 3/2$ or $4 - 3x = -x - 3/2$

$\frac{5/2}{4} = \frac{4x}{4}$ $\quad \frac{-2x}{-2} = \frac{-11/2}{-2}$

$x = 5/8$ OR $x = 11/4$

*check for extraneous

h) $\frac{1}{4}|x-3| + 2 < 1$

$\frac{1}{4}|x-3| < -1$

$|x-3| < -4$

*No solution

i) $5|3t-7| + 4 > 29$

$5|3t-7| > 25$

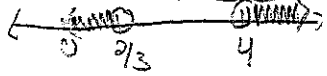
$|3t-7| > 5$

$3t - 7 > 5$ or $3t - 7 < -5$

$+7 \quad +7$ $\quad \frac{3t}{3} < \frac{2}{3}$

$3t > 12$

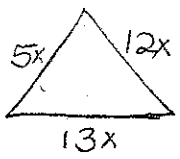
$t > 4$ OR $t < 2/3$



2. a) $x$ = 1st #
$x+1$ = 2nd #
$x+2$ = 3rd #
$x+3$ = 4th #

$x+1+x+3=2514$
$2x+4=2514$
$x=$ 1255, 1256, 1257, 1258

b.)




$5x+12x+13x=15$
$30x=15$
$x=1/2$
2.5in, 6in, 6.5in

c.) $y=2000+.04x$
$y$ = amount earned
$x$ = amount sales *
$5000 \geq 2000+.04x$
$3000 \geq .04x$
$x \geq 75{,}000$

3. a) $\left(\frac{x+fw}{n}\right)=(y)n$
$x+fw=yn$
$x=yn-fw$
$n \neq 0$

b.) $ax+b=cx+d$
$ax-cx=d-b$
$\frac{x(a-c)}{a-c}=\frac{d-b}{a-c}$
$x=\frac{d-b}{a-c}$
$a \neq c$

c.) $c(x-3)+dx=9+x$
$cx-3c+dx=9+x$
$cx+dx+x=9+3c$
$x(c+d+1)=9+3c$
$x=\frac{9+3c}{c+d+1}$ $c+d \neq -1$

## Part 2: Function Notation

4. a.) $t(n)-r(n)$
$(5n^2-4n+6)-(3n^2+n-11)$
$5n^2-4n+6-3n^2-n+11$
$2n^2-5n+17$

b.) $w(n)-t(n)+v(n)$
$(-2n-10)-(5n^2-4n+6)+(-2n^2+20)$
$-2n-10-5n^2+4n-6-2n^2+20$
$-7n^2+2n+4$

c.) $2w(n)-3t(n)-r(n)$
$2(-2n-10)-3(5n^2-4n+6)-(3n^2+n-11)$
$-4n-20-15n^2+12n-18-3n^2-n+11$
$-18n^2+7n-27$

d.) $w(n)\cdot v(n)$
$(-2n-10)(-2n^2+20)$
$4n^3-40n+20n^2-200$
$4n^3+20n^2-40n-200$

5. a) $f(g(1))$

$g(1) = 2(1)^3 - 5(1) + 1$

$g(1) = -2$

$f(-2) = -(-2)^2 - 6$

$f(g(1)) = -10$

b.) $h(f(-1))$

$f(-1) = -(-1)^2 - 6$

$f(-1) = -7$

$h(-7) = (-7+1)^2 - (-7)$

$h(f(-1)) = 43$

c.) find $x$ if $f(x) = 10$

$10 = -x^2 - 6$

$+6 \quad +6$

$\frac{16}{-1} = \frac{-x^2}{-1}$

$\sqrt{-16} = \sqrt{x^2}$

* NO solution

d.) $f(f(a^2))$

$f(a^2) = -(a^2)^2 - 6$

$f(a^2) = -(a^4) - 6$

$f(-(a)^4 - 6) = -(-(a)^4 - 6)^2 - 6$

$= -(-a^4 - 6)^2 - 6$

$= -(a^4 - 6)(a^4 - 6) - 6$

$= -(a^8 + 12a^4 + 36) - 6$

$= -a^8 - 12a^4 - 42$

6. a) find $(A \circ r)(2)$

same as $A(r(2))$

$r(2) = 12.5(2)$

$r(2) = 25$ in.

$A(25) = \pi(25)^2$

$= 625\pi$

$\approx 1963.50 \text{ in}^2$

b.) area after 4 sec.

$A(r(4))$

$r(4) = 12.5(4)$

$r(4) = 50$ in

$A(50) = \pi(50)^2$

$= 2500\pi$

$\approx 7,853.98 \text{ in}^2$

7. Price after 10% discount = $f(x) = .90x$

Price after 3500 rebate = $g(x) = x - 3500$

$x$ = price of car

* use discount first because taking a % of a bigger # will give you a bigger discount

Discount first

$g(f(x)) = g(f(22,000))$

$f(22,000) = .90(22,000)$

$= \$19,800$

$g(19,800) = 19,800 - 3500$

$= \$16,300$

Rebate first

$f(g(x)) = f(g(22,000))$

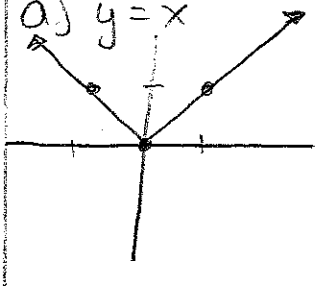
$g(22,000) = 22,000 - 3500$

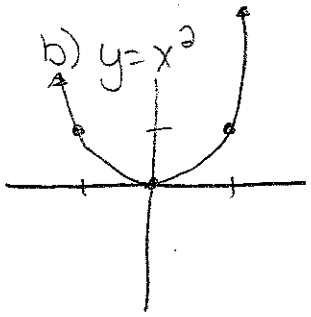
$g(22,000) = 18,500$

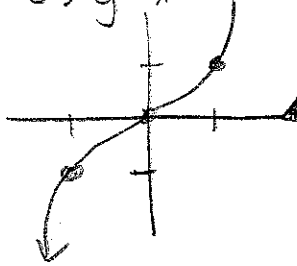
$f(18,500) = .90(18,500)$

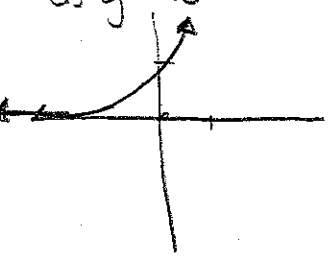
$= \$16,650$

## Part 3: Function Families and their Properties

8. a) $y = x$ 

b) $y = x^2$ 

c.) $y = x^3$ 

d) $y = b^x$ 

9. a) transform the function $y = |x|$ by reflecting over the x-axis, stretch by a factor of 2, and translate left 3 and down 1.

b) transform the function $y = x^3$ by: shrink by a factor of ½ and translate right 2.

c) transform the function $y = 2^x$ by reflecting over the x-axis and translating left 1 and up 1

d) transform the function $y = x^2$ by shrinking by a factor of 3/5 and translating down 11.

10. The graph of the second function is the same as the first except translated down 3.

11. $y = |x+1| + 2$

12. a) -Yes; because every x has 1 y
- As $x \to \infty$, $y \to -\infty$; As $x \to -\infty$, $y \to -\infty$
- Roots: $x \approx 1.2$ & $x \approx 6.9$
- Absolute max: $y = 8$
- zeros: $x \approx 1.2$ & $x \approx 6.9$
- Domain: $\mathbb{R}$ Range: $(-\infty, 8]$
- increasing: $(-\infty, 4)$ decreasing: $(4, \infty)$
- x-int: $(1.2, 0)$ & $(6.9, 0)$ y-int: $(0, -8)$

b.) Yes, every x has 1 y
- As $x \to \infty$, $y \to \infty$
- As $x \to -\infty$, $y \to -6$
- Roots $x \approx 1.63$
- max/min; none
- zeros $x \approx 1.63$
- Domain: $\mathbb{R}$ Range: $(-6, \infty)$
- increasing $(-\infty, \infty)$ decreasing: never
- x int $(1.63, 0)$ y-int $(0, -5)$
- inverse is a function

# Part 4: Linear Functions

13. $(2,4)$ $(-5,6)$

$m = \frac{6-4}{-5-2} = \frac{2}{-7}$

$y - y_1 = m(x - x_1)$

$y - 4 = -\frac{2}{7}(x - 2)$

$y - 4 = -\frac{2}{7}x + \frac{4}{7}$

$+4 \qquad +4$

$y = -\frac{2}{7}x + 32/7$

14. $m = -1/3$ $(-3,5)$

$y - y_1 = m(x - x_1)$

$y - 5 = -\frac{1}{3}(x + 3)$

$y - 5 = -\frac{1}{3}x - 1$

$+\frac{1}{3}x + 5 \qquad +5$

$3\left(\frac{1}{3}x + y = 4\right)$

$x + 3y = 12$

* Remember NO Fractions/decimals in standard form and A must be positive!

15. $(2,6)$ parallel $y = 2x + 1$

$m = 2$

* parallel lines = same slope

$y - y_1 = m(x - x_1)$

$y - 6 = 2(x - 2)$

$y - 6 = 2x - 4$

$+6 \qquad +6$

$y = 2x + 2$

16. $(-1,3)$ perpendicular $3x - 4y = 12$

$m = -4/3$

$-3x \qquad -3x$

$-4y = -3x + 12$

$y = \frac{3}{4}x - 3$ $(m = 3/4)$

* perp. lines = opposite reciprocal slope

$y - 3 = -\frac{4}{3}(x + 1)$

$y - 3 = -\frac{4}{3}x - \frac{4}{3}$

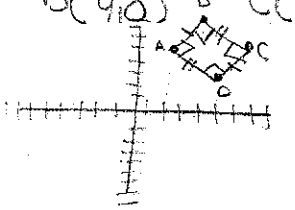
$+3 \qquad +3$

$y = -\frac{4}{3}x + \frac{5}{3}$

17. (0,8) vertical

$x = 8$

18. A(2,5) B(4,8) C(7,6) D(5,3)




$\overline{AB}$: $m = \frac{8-5}{4-2} = 3/2$

$\overline{BC}$: $m = \frac{6-8}{7-4} = -2/3$

$\overline{CD}$: $m = \frac{3-6}{5-7} = \frac{-3}{-2} = 3/2$

$\overline{AD}$: $m = \frac{5-3}{2-5} = \frac{2}{-3}$

* this is a rectangle because $\overline{AB} \parallel \overline{DC}$ and $\overline{BC} \parallel \overline{AD}$ because they have the same slope. Also $\overline{AB} \perp \overline{BC}$ and $\overline{AB} \perp \overline{AD}$ because slopes are opposite reciprocal. (forms 90° angle) Lastly $\overline{CD} \perp \overline{BC}$ and $\overline{DC} \perp \overline{AD}$

19. a) $y = 1/3x - 9$

x-int: $0 = 1/3x - 9$; $9 = (1/3x)3$; $x = 27$ (27,0)

y-int: $y = 1/3(0) - 9$; $y = -9$ (0,-9)

b) $x - 3y = 10$

x int: $x - 3(0) = 10$; $x = 10$ (10,0)

y-int: $\frac{0 - 3y}{-3} = \frac{10}{-3}$; $y = 10/3$ (0, -10/3)

c.) $-Rx + Sy = T$

x int: $\frac{-Rx}{-R} = \frac{T}{-R}$; $x = -T/R$ $\left(\frac{-T}{R}, 0\right)$

y int: $\frac{Sy}{S} = \frac{T}{S}$; $y = T/S$ $\left(0, \frac{T}{S}\right)$

20. $y = 1350 - 20x$ $x$ = # mins; $y$ = height (ft) balloon

$0 = 1350 - 20x$

$\frac{-1350}{-20} = \frac{-20x}{-20}$

$x =$ (67.5 mins when the balloon is on the ground)

21. $x$ = # miles (2, 5.25) (5, 10.50)

$y$ = cost cab

$m = \frac{10.50 - 5.25}{5 - 2} = \frac{5.25}{3} = 1.75$

$y - y_1 = m(x - x_1)$

$y - 5.25 = 1.75(x - 2)$

$y - 5.25 = 1.75x - 3.5$

$y = 1.75x + 1.75$

$x = 3.8$ $y = 1.75(3.8) + 1.75$

$= \$8.40$

22. $x$ = ounces of Protein
$y$ = ounces of granola

$7x + 3y = 28$
$7x + 3(0) = 28$
$7x = 28$
$x =$ 4oz. Protein

23. a) $\begin{cases} y = -x - 9 \\ 3x - y = -11 \end{cases}$

$3x - (-x - 9) = -11$
$3x + x + 9 = -11$
$4x + 9 = -11$
$4x = -20$
$x = -5$

$y = -x - 9$
$y = -(-5) - 9$
$y = -4$

* $(-5, -4)$

b) $\begin{cases} 4x - 2y = 6 \\ -4x - 3y = 5 \end{cases}$

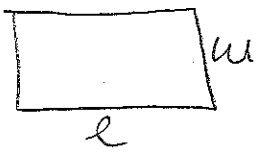
$y = 1$

$4x - 2y = 6$
$4x - 2(1) = 6$
$4x = 8$
$x = 2$

$(2, 1)$

* You can use any method for solving systems (graphing, substitution, or elimination)

24. Perimeter = 98in
$w$ = width
$l$ = length




$\begin{cases} 98 = 2w + 2l \\ l = 4w + 9 \end{cases}$

$98 = 2w + 2(4w + 9)$
$98 = 2w + 8w + 18$
$80 = 10w$
$w = 8$in

$l = 4(8) + 9$
$l = 41$in

25. $x$ = daily wage men
$y$ = daily wage boys

$-2(15x + 5y = 3350) = -30x - 10y = -6700$
$3(10x + 7y = 2600) = +30x + 21y = 7800$

$11y = 1100$
$y = \$100$

* $190 men
$100 boys

$15x + 5(100) = 3350$
$15x + 500 = 3350$
$15x = 2850$
$x = \$190$

26. $x$ = # College of Ed Alumni
$y$ = # College of Engineering Alumni

$\begin{cases} -150(x + y = 4200) \\ 150x + 100y = 545{,}000 \end{cases}$

$-150x - 150y = -630{,}000$
$+\ 150x + 100y = 545{,}000$
$-50y = -85{,}00$
$y = 1700$

$x + y = 4200$
$x + 1700 = 4200$
$x = 2500$

1700 Engineering Alumni
2500 Education Alumni

27. $x$ = # mins
$y$ = cost

Plan 1: $y = 100 + .03x$
Plan 2: $y = 50 + .10x$

* Set the 2 plans equal to eachother

$100 + .03x = 50 + .10x$
$-50 \quad -.03x \quad -50 \quad -.03x$
$50 = .07x$
$x = 714.29$

At 714.29 mins. the plans cost the same
↳ cost is $121.43

## Part 5: Exponent Properties

28. a) $\frac{(19a^2b^3c^3z^4)(2a^3b^2c^4z^5)}{38a^5b^5c^7z^9}$

b.) $\frac{(-6x^7y^2)^{-6}}{-6^{-6}x^{-42}y^{-12}} = \frac{1}{46656x^{42}y^{12}}$

c.) $\frac{a^4b^2}{a^3b^9a^2} = \frac{a^4b^2}{a^5b^9} = \frac{1}{ab^7}$

d.) $\left(\frac{7^9c^3d^{-1}}{7^7c^9d^4}\right)^{-3} = \frac{7^{-27}c^{-9}d^{3}}{7^{-21}c^{-27}d^{-12}} = 7^{-6}c^{18}d^{9} = \frac{c^{18}d^9}{7^6}$ or $\frac{c^{18}d^9}{117{,}649}$

e.) $\frac{2(a^{-3})^2b^4c^2}{6a^4b^{-2}c^5} = \frac{2a^{-6}b^4c^2}{6a^4b^{-2}c^5} = \frac{1a^{-10}b^6c^{-3}}{3} = \frac{b^6}{3a^{10}c^3}$

f.) $\frac{5x^5y^{-4}}{x^{-4}y^5} \cdot \frac{3x^4y^9}{2x^{-2}y} = \frac{15x^9y^5}{2x^{-6}y^6} = \frac{15x^{15}}{2y}$

# Part 6: Exponential Functions

29. a) $y = -0.9x\left(\frac{5}{2}\right)^x$ → growth because $b > 1$
b) $y = 0.75(.3)^x$ → decay because $0 < b < 1$

30. a) $y = \frac{3}{7}\left(\frac{3}{4}\right)^x$ "b"
$b = 1 + r$
$.75 = 1 + r$
$r = -.25$ = 25% decrease

b) $y = 2(3.4)^x$ "b"
$b = 1 + r$
$3.4 = 1 + r$
$r = 2.4$ = 240% increase

* Don't forget to turn a % into a decimal!

31. a.) $-78\% = r$ $b = 1 + r$ $b = 1 - .78$ $b = .22$

b.) $.89\% = r$ = $b = 1 + r$ $b = 1 + .0089$ $b = 1.0089$

32. a) asymptote: $y = -16$
transformations:
shrink by .02 and translate left 6 and down 16.

b.) asymptote: $y = 0$
transformations:
reflect over the x-axis translate right 4.

33. $y = ab^x$ $b = 1 + .02$ $y = 1573(1.02)^{10}$ $y = 1917.47$ = 1917 bears in 10 years

y = # bears
x = # years

34. $y = ab^x$ $y = 1350(1/4)^{x/6}$ $y = 1350(1/4)^{4/6}$ $y = .02$ ants after 4 years

y = # ants
x = # months

35. $(-1, 12.5)$ $y = ab^x$ $12.5 = ab^{-1}$ $a = \frac{12.5}{b^{-1}}$ $a = 12.5b$

$(4, 4.096)$ $y = ab^x$ $4,096 = 12.5b(b)^4$ $4,096 = 12.5b^5$ $(0.32768)^{\frac{1}{5}} = (b^5)^{\frac{1}{5}}$ $0.8 = b$

$a = 12.5b$ $a = 12.5(.8)$ $a = 10$ $y = 10(.8)^x$

36. Any situation that has an initial value of 5000 and decreases by 37%

37. $y = 1800e^{.049x}$ $x$ = # years, $y$ = amount

$y = 1800e^{.049(6)}$

$= \$2,415.21$

38. $920 = a\left(1+\frac{.02}{2}\right)^{2(2)}$ (semi-annually; # years)

$920 = a(1.01)^4$

$920 = 1.04a$

$a = \$884.10$

39. $y = a(1/2)^{x/hl}$

$y = 7(1/2)^{25/120}$ $y = 6.94$ mg Radium

40. $y = ab^x$

$y = 700\left(1+\frac{.039}{4}\right)^{4x}$ $x=4$

$y = 700(1.00975)^{16}$

$y = \$817.56$

41. $8000 = ae^{.052(5)}$ (amount wants to save; # years)

$8000 = 1.29693(a)$

$a = \$6,168.41$

## Part 7: Log Functions

42. $\log_4\left(\frac{1}{16}\right) = -2 \Rightarrow 4^{-2} = \frac{1}{16}$

43. $3^4 = 81 \Rightarrow \log_3 81 = 4$

44. $\log_4 32$ $4^x = 32$

$2^{2x} = 2^5$

$2x = 5$ $x = 5/2$

45. a) $pH = -\log[H^+]$

$= -\log(7.3 \times 10^{-3})$

$pH \approx 2.14$

b) $pH = -\log[H^+]$

$3.2 = -\log[H^+]$

$-3.2 = \log[H^+]$

$10^{-3.2} = [H^+]$

$[H^+] \approx 6.31 \times 10^{-4}$ or $0.000631$

46.) a) $\log_7 x + 3\log_7 y - \frac{1}{2}\log_7 z$

$\log_7 x + \log_7 y^3 - \log_7 z^{1/2}$

$\log_7 xy^3 - \log_7 z^{1/2}$

$\log_7 \frac{xy^3}{z^{1/2}}$ or $\log_7 \frac{xy^3}{\sqrt{z}}$

b) $3(\ln p + \ln 3) - \ln 9$

$\ln p^3 + \ln 3^3 - \ln 9$

$\ln 27p^3 - \ln 9$

$\ln \frac{27p^3}{9}$ $\ln 3p^3$

c.) $\ln x - \frac{1}{2}\ln y + \frac{1}{2}\ln z$

$\ln x - \ln y^{1/2} + \ln z^{1/2}$

$\ln \frac{x z^{1/2}}{y^{1/2}}$ or $\ln x\sqrt{\frac{z}{y}}$

47. a) $\log 7(x-2)^2$

$\log 7 + \log(x-2)^2$

$\log 7 + 2\log(x-2)$

b) $\log_5 5x^{-5}$

$\log_5 5 + \log_5 x^{-5}$

$\log_5 5 - 5\log_5 x$

$1 - 5\log_5 x$

c) $\log \sqrt[3]{\frac{2r^3 t}{3w^2}}$

$\log \frac{2^{1/3} r^{1/3} s^{1/3} t^{1/3}}{3^{1/3}(w^2)^{1/3}}$

$\frac{1}{3}\log 2 + \frac{1}{3}\log r + \frac{1}{3}\log s + \frac{1}{3}\log t - \frac{1}{3}\log 3 - \frac{2}{3}\log w$

48. a) $2\log x - \log 4 = 2$

$\log \frac{x^2}{4} = 2$

$4(10^2) = \left(\frac{x^2}{4}\right)4$

$(400)^{1/2} = (x^2)^{1/2}$

$x = 20$

b) $\log(x+21) = 2 + \log x$

$-\log x \quad -\log x$

$\log(x+21) - \log(x) = 2$

$\log \frac{x+21}{x} = 2$

$x(10^2) = \left(\frac{x+21}{x}\right)x$

$100x = x + 21$

$-x \quad -x$

$\frac{99x}{99} = \frac{21}{99}$

$x \approx .21$

c.) $11^{x+1} - 50 = 12$

$+50 \quad +50$

$\log_2(11^{x+1}) = \log 62$

$\frac{(x+1)\log 11}{\log 11} = \frac{\log 62}{\log 11}$

$x + 1 = \frac{\log 62}{\log 11} - 1$

$-1 \quad -1$

$x \approx 0.7211$

d.) $\ln \frac{2x}{41} = 2$

$41(e^2) = \left(\frac{2x}{41}\right)41$

$\frac{41e^2}{2} = \frac{2x}{2}$

$x \approx$

e.) $\frac{7e^{5x+8}}{7} = \frac{0.23}{7}$

$\ln e^{5x+8} = \ln 0.3286$

$(5x+8)\ln e = \ln .3286$

$-8 \quad -8$

$\frac{5x}{5} = \frac{\ln .3286 - 8}{5}$

$x \approx -2.283$

f.) $e^{x/5} + 8 = 40$

$-8 \quad -8$

$\ln e^{x/5} = (32)\ln$

$\frac{x}{5}\ln e = \ln 32$

$5\left(\frac{x}{5}\right) = (\ln 32)5$

$x \approx 17.329$